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Swedish National Seismic Network (SNSN)

A short report on recorded earthquakes during the second quarter of the year 2005

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July 2005

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Keywords: Seismic network, Earthquakes.

Abstract

According to an agreement with Swedish Nuclear Fuel and Waste Management Company (SKB) and Uppsala University, the Department of Earth Sciences has continued to carry out observation and additional construction of new seismic stations within the Swedish National Seismic Network (SNSN). This short report gives some information about the recorded seismicity during April through June 2005.

The Swedish National Seismic Network consists of 48 stations in operation whereof one has been taken into operation in Oskarshamn and one in Forsmark. Additional 12 are under construction. During April through June, 1,058 events were located whereof 133 are estimated as real earthquakes, 776 are estimated as explosions and 149 events are still considered as uncertain but these are mainly located outside the network.

The largest earthquake M_L =3.1 occurred on May 13th located 16 km east of Sundsvall. Additionally four earthquakes reached magnitude M_L =2.0 during the period.

Sammanfattning

Enligt avtal mellan Svensk Kärnbränslehantering AB (SKB) och Uppsala Universitet, Institutionen för Geovetenskaper, fortsätter Uppsala Universitet att driva och bygga ut seismiska mätstationer i det svenska seismiska nätet (SNSN). Denna rapport ger information om registrerade händelser under tidsperioden april till juni 2005.

Det seismiska nätet består av 48 stationer som nu är i drift varav en som har tagits i drift är belägen i Oskarshamn och en i Forsmark. Ytterligare 12 stationer är under uppbyggnad. Under perioden april till juni, 2005 var det 1 058 registrerade händelser varav 133 bedömdes som äkta jordskalv, 776 bedömdes fara förorsakade av explosioner eller sprängningar samt 149 var osäkra händelser, men dessa var i huvudsak lokaliserade utanför det seismiska nätet.

Det största jordskalvet med en magnitud på 3,1 inträffade den 13 maj, lokaliserad 16 km öster om Sundsvall. Ytterligare fyra skalv nådde magnitud 2,0 under perioden.

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1 Introduction

This document reports the seismic events recorded by the Swedish National Seismic Network (SNSN) for the second quarter of the year 2005. The work was carried out in accordance with activity plan AP TD F73-01-013. In Table 1-1 controlling document for performing this activity is listed. The activity plan is an SKB internal controlling document.

At present 48 stations are in operation whereof one has been taken into operation in Oskarshamn and one in Forsmark, Figure 1-1. Additional 12 stations are under construction, 10 in the southwestern part of Sweden and two will be located in the north.

The report includes fundamental information about the seismic events, including origin time, hypocenter location. Information about the source parameters is not included in the present report but is delivered as separate ASCII-text. This report is a preliminary report including only the automatic and the brief interactive analysis done on the routine bases at SNSN.

Table 1-1. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Drift av seismologiskt nät längs Östersjöns kust	AP TD F73-01-013	

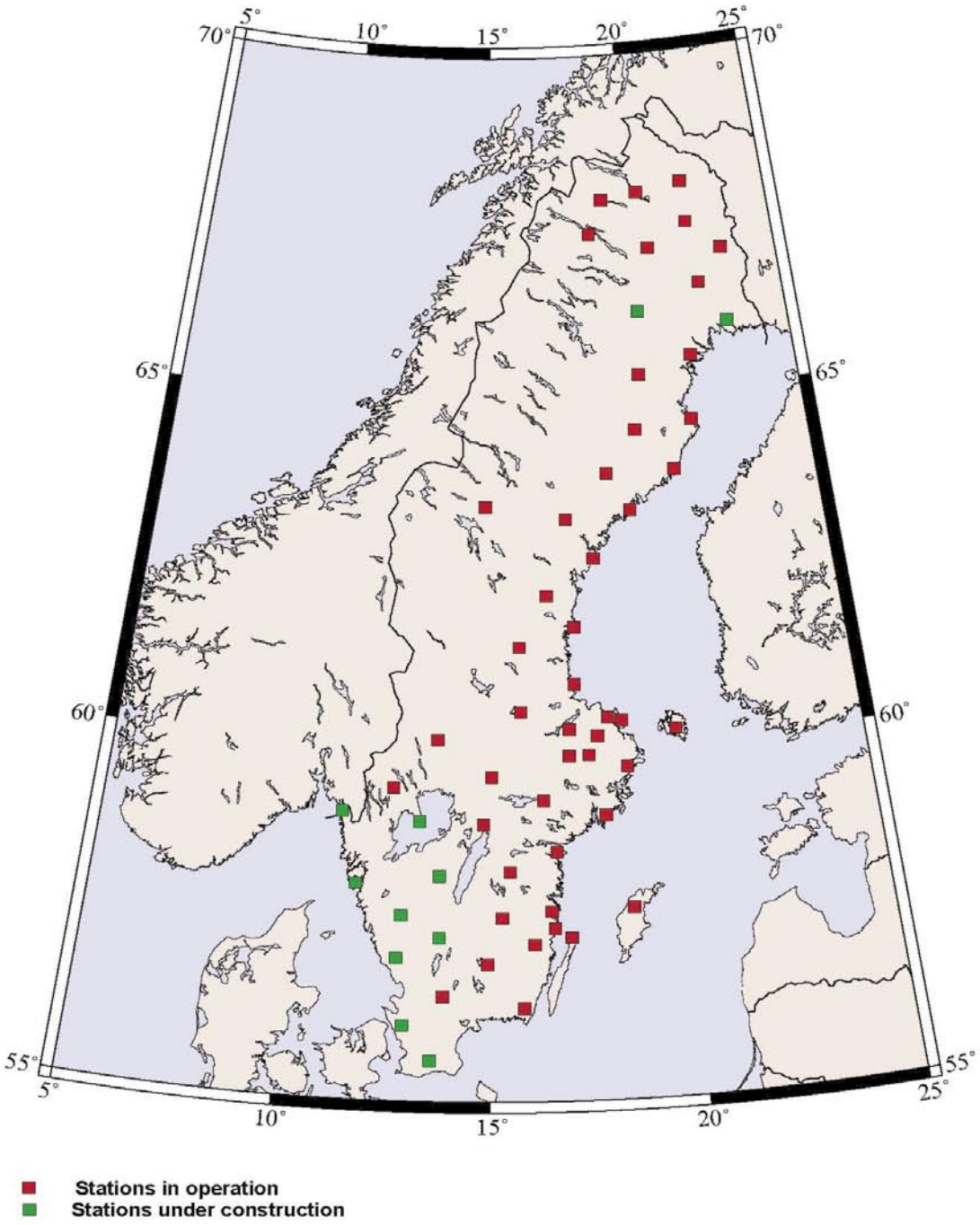

Figure 1-1. *The present Swedish National Seismic Network (SNSN).*

2 Objective and scope

According to an agreement with Swedish Nuclear Fuel and Waste Management Company (SKB) and Uppsala University, the Department of Earth Sciences continues to carry out observations and additional construction of new seismic stations within the Swedish National Seismic Network (SNSN).

The goal is to complement the existing regional seismic network to establish a local seismic network that also permits registration of small earthquakes in order to obtain relatively long time series and thereby gain a better understanding of the causes of seismic events in the site investigation areas.

Fundamental information about the seismic events, including origin time, hypocenter location and information about the source parameters are given after every three month period.

The sensitivity of the network allows for complete recording of all earthquakes down to a magnitude of lower than 0.5 within the network and down to magnitude 0.0 near the proposed nuclear waste deposit sites.

3 Recorded earthquakes during the second quarter of 2005

Figure 3-1 shows the recorded events in Sweden during April through June. During the period 1,058 events were located whereof 133 are estimated as real earthquakes (which are shown in Figure 3-2). 776 are estimated as explosions and 149 events are still considered as uncertain but these are mainly located outside the network.

The largest earthquake M_L = 3.1 occurred on May 13th located 16 km east of Sundsvall. Additionally four earthquakes reached magnitude M_L = 2.0 during the period.

Event lists for April through June 2005 are given in Sections 3.1 through 3.3.

3.1 April

Event list for April is given in Table 3-1 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In April 50 events were located whereof one with magnitude 2.4 located 52 km NW of Pajala, and one with magnitude 2.2, located 42 km west of Piteå. Additional 10 earthquakes had magnitude above 1.0. The depth range of the events varies between 0.2 and 36.2 km.

Table 3-1. Date, time (UTC), latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (M_L) of recorded earthquakes in April.

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050401	194229.7	67.470	22.311	7,500.6	1,777.7	18.0	0.3
20050402	000452.0	67.500	23.980	7,512.3	1,848.2	13.9	0.4
20050402	001339.5	67.506	24.019	7,513.2	1,849.8	11.8	2.4
20050402	002229.8	67.506	23.974	7,513.0	1,847.9	4.2	0.9
20050402	140756.6	60.358	16.276	6,693.4	1,525.8	0.2	–0.3
20050403	031345.3	63.637	16.523	7,058.8	1,535.4	2.5	0.9
20050403	121846.0	64.252	20.454	7,135.4	1,725.1	4.4	1.0
20050404	055855.9	62.120	17.094	6,890.3	1,567.1	19.2	0.6
20050404	221315.3	64.429	21.058	7,157.3	1,752.7	17.3	–0.3
20050405	084539.3	66.938	22.905	7,444.4	1,809.8	5.3	0.0
20050405	101437.5	65.426	21.878	7,271.6	1,781.4	21.4	0.6
20050405	163500.4	64.350	20.792	7,147.6	1,740.6	19.2	–0.1
20050406	121649.3	64.421	20.972	7,156.1	1,748.6	19.3	0.3
20050406	194349.4	61.847	17.580	6,860.4	1,593.3	35.2	0.3
20050408	200409.2	64.340	20.706	7,146.2	1,736.5	19.0	1.0
20050408	205019.2	67.897	19.751	7,538.9	1,665.5	2.9	0.6
20050408	221848.7	64.711	21.472	7,190.4	1,769.7	32.6	0.0
20050409	053625.7	64.072	20.584	7,115.8	1,732.9	17.8	–0.0

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050409	145725.2	65.248	22.141	7,253.1	1,795.5	5.1	0.5
20050409	153047.5	61.827	18.757	6,860.5	1,655.3	17.4	0.4
20050410	164207.2	67.245	19.806	7,466.5	1,672.5	19.3	0.2
20050411	121304.4	64.383	20.648	7,150.6	1,733.4	18.6	1.8
20050412	031414.5	67.359	23.962	7,496.6	1,849.5	9.0	0.9
20050412	082932.3	64.532	20.348	7,166.1	1,717.7	0.2	0.7
20050413	040022.9	60.537	16.215	6,713.2	1,522.3	13.3	0.0
20050413	101237.1	65.209	22.626	7,251.1	1,818.6	14.4	1.0
20050413	150559.7	65.378	20.512	7,260.9	1,718.6	19.2	2.2
20050413	154035.3	65.211	22.621	7,251.3	1,818.3	14.0	1.0
20050414	081000.4	68.014	22.850	7,563.4	1,793.8	5.9	1.1
20050416	061139.3	60.189	15.983	6,674.5	1,509.7	6.5	–0.0
20050416	193558.7	66.871	23.625	7,440.6	1,842.0	10.1	–0.2
20050417	223146.3	64.708	21.319	7,189.4	1,762.5	17.3	0.3
20050418	090159.9	68.407	20.576	7,598.1	1,695.7	5.9	1.1
20050418	154933.5	64.496	18.188	7,156.5	1,614.3	36.2	0.1
20050419	163228.1	63.978	20.882	7,106.6	1,748.2	13.5	1.0
20050420	003024.8	61.541	16.736	6,825.4	1,549.3	18.7	–0.2
20050421	160712.6	63.087	18.421	7,000.1	1,632.0	9.1	0.8
20050422	051351.4	64.013	20.490	7,109.0	1,728.8	5.5	0.2
20050424	094620.5	65.448	22.270	7,275.9	1,799.3	16.6	–0.1
20050424	171531.4	63.674	19.779	7,068.9	1,696.4	16.6	0.4
20050424	182431.0	64.985	21.165	7,219.6	1,752.6	16.9	1.4
20050425	001822.5	64.500	21.198	7,165.8	1,758.7	22.4	0.1
20050426	014327.1	59.989	16.237	6,652.2	1,524.0	13.1	0.6
20050426	190504.1	67.768	19.571	7,524.0	1,658.8	17.3	0.1
20050426	195658.9	64.479	20.590	7,161.2	1,729.8	27.4	1.0
20050427	060511.6	67.772	19.480	7,524.2	1,655.0	17.2	–0.1
20050427	213523.3	64.375	20.694	7,150.0	1,735.7	10.3	–0.2
20050429	014947.5	62.291	17.359	6,909.6	1,580.5	17.2	0.4
20050429	065123.8	64.467	21.062	7,161.6	1,752.5	19.0	–0.1
20050430	133644.7	62.165	19.446	6,900.0	1,689.5	15.9	0.6

3.2 May

Event list for May is given in Table 3-2 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In May 48 events were located whereof one with magnitude 3.1, located 16 km east of Sundsvall. Another earthquake with magnitude 2.5 was located 84 km N-E of Kiruna. One earthquake with magnitude 1.8 was located 25 km southwest of Skellefteå. Additional 10 events had magnitude equal or larger than 1.0. The depth range of the events varies between 3.0 and 40.3 km.

Table 3-2. Date, time (UTC), latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (M_L) of recorded earthquakes in May.

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050501	055810.8	64.572	21.182	7,173.7	1,757.3	15.5	1.5
20050501	153001.1	67.951	19.534	7,544.4	1,656.1	17.0	–0.2
20050501	203337.7	61.737	16.793	6,847.3	1,552.0	21.0	–0.3
20050501	211745.2	67.179	19.597	7,458.5	1,664.0	40.3	0.1
20050502	080253.7	66.138	22.231	7,352.3	1,789.6	20.2	0.4
20050503	205722.7	62.599	17.654	6,944.3	1,594.8	24.2	1.9
20050504	055009.4	64.559	20.533	7,169.9	1,726.3	19.7	–0.4
20050504	120440.5	62.157	17.412	6,894.8	1,583.6	11.2	1.3
20050504	204159.0	58.739	13.237	6,515.7	1,351.2	6.8	1.1
20050506	045920.1	64.945	21.071	7,214.7	1,748.5	17.4	0.5
20050506	123555.3	64.587	20.477	7,172.8	1,723.5	17.6	0.1
20050507	045158.5	64.621	20.739	7,177.5	1,735.7	26.5	–0.1
20050508	070629.8	67.480	18.943	7,490.4	1,634.0	8.3	1.9
20050508	085035.5	64.793	21.531	7,199.8	1,771.7	4.4	0.5
20050508	152940.5	67.478	18.944	7,490.2	1,634.0	7.5	0.9
20050508	164936.1	65.144	21.166	7,237.3	1,751.1	18.8	0.3
20050509	183027.4	62.302	17.239	6,910.6	1,574.2	17.5	0.2
20050510	044927.7	64.385	20.881	7,151.8	1,744.6	12.4	0.2
20050510	153417.3	64.227	20.266	7,132.0	1,716.2	17.1	–0.5
20050512	022602.6	65.221	21.740	7,248.3	1,777.2	18.1	0.1
20050512	195749.9	64.483	20.828	7,162.5	1,741.1	5.3	–0.2
20050513	002144.3	64.582	21.172	7,174.8	1,756.7	16.2	0.0
20050513	121820.9	67.480	18.939	7,490.5	1,633.8	10.3	1.3
20050513	152918.0	67.563	19.044	7,500.0	1,637.8	10.5	0.3
20050513	185330.1	62.397	17.650	6,921.8	1,595.2	17.9	3.1
20050514	141648.7	65.318	20.813	7,255.3	1,733.1	22.5	0.2
20050515	114906.3	62.292	17.378	6,909.8	1,581.5	16.7	–0.1
20050515	123501.2	64.197	21.021	7,131.5	1,753.0	25.0	0.2
20050515	225918.0	64.501	21.104	7,165.6	1,754.2	21.8	0.2
20050515	235330.4	64.556	20.154	7,168.2	1,708.2	30.5	0.2
20050518	143919.0	64.501	21.211	7,166.0	1,759.3	20.0	0.0
20050518	183625.9	66.897	23.879	7,445.0	1,852.7	13.6	0.3
20050518	235803.3	67.480	18.938	7,490.4	1,633.8	14.8	1.9
20050519	153006.0	68.239	20.490	7,579.1	1,693.6	24.1	0.5

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050520	131012.3	67.805	19.454	7,527.9	1,653.7	4.3	0.4
20050521	000402.2	63.674	19.776	7,068.8	1,696.3	17.8	0.4
20050521	015130.6	64.362	20.666	7,148.4	1,734.4	18.7	–0.3
20050521	111901.2	61.164	16.551	6,783.3	1,540.0	28.6	0.3
20050521	132734.7	66.042	22.557	7,343.2	1,805.4	18.0	1.8
20050521	133925.1	66.059	22.412	7,344.4	1,798.7	14.9	0.4
20050521	135210.5	66.043	22.593	7,343.5	1,807.0	17.2	0.7
20050522	015943.3	64.471	20.562	7,160.2	1,728.5	27.8	1.3
20050522	054632.1	65.150	22.433	7,243.6	1,810.3	18.2	1.0
20050522	195923.4	62.633	17.252	6,947.6	1,574.1	17.9	0.1
20050525	131625.1	64.541	20.597	7,168.1	1,729.6	11.4	1.8
20050526	112553.7	68.194	22.012	7,579.6	1,756.9	18.6	2.5
20050529	184908.7	59.459	14.223	6,594.2	1,410.1	12.1	0.9
20050529	231208.0	67.754	19.526	7,522.3	1,657.0	3.0	0.2

3.3 June

Event list for June is given in Table 3-3 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In June 35 events were located whereof one with magnitude 3.1 in Norway 184 km west of Arjeplog and one with magnitude 2.0 both located 77 km southeast of Luleå. Additional 8 earthquakes had magnitudes above 1.0. The depth range of the events varies between 2.1 and 33.1 km.

Table 3-3. Date, time (UTC), latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (M_L) of recorded earthquakes in June.

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050601	060506.2	63.411	19.107	7,037.7	1,664.7	18.4	0.2
20050602	074217.6	67.262	19.495	7,467.5	1,659.0	20.7	1.2
20050602	210137.1	67.982	19.388	7,547.4	1,649.8	5.5	–0.8
20050602	215454.8	64.500	20.756	7,164.1	1,737.5	27.0	0.4
20050603	201439.8	63.212	21.215	7,022.7	1,771.7	19.7	1.8
20050604	085339.2	67.570	18.647	7,499.9	1,620.9	11.2	0.5
20050605	164837.3	61.818	17.299	6,856.8	1,578.6	27.4	–0.1
20050606	021852.1	65.556	21.764	7,285.6	1,774.8	9.2	1.4
20050606	145607.5	63.976	18.857	7,100.0	1,649.2	33.1	0.3
20050608	053503.0	67.409	18.773	7,482.2	1,627.1	8.7	0.9
20050609	081620.7	64.433	21.085	7,157.9	1,753.9	21.1	0.5
20050610	113619.0	64.445	20.696	7,157.8	1,735.1	17.9	1.1
20050610	143233.6	64.787	21.141	7,197.5	1,753.3	17.5	0.2
20050610	194918.9	64.775	20.974	7,195.5	1,745.5	19.5	0.2
20050612	011907.1	63.086	14.838	6,997.6	1,451.0	2.7	1.2

Date	Time (UTC)	Latitude	Longitude	X RT90 km	Y RT90 km	Depth km	M_L Local magnitude
20050613	021846.7	67.796	20.232	7,529.1	1,686.5	29.7	0.2
20050613	165101.4	61.964	16.548	6,872.4	1,538.8	7.8	–0.5
20050614	045327.4	61.897	17.086	6,865.4	1,567.2	18.4	0.2
20050616	014638.3	64.909	20.520	7,208.8	1,722.9	18.8	0.1
20050616	024521.9	61.865	17.566	6,862.4	1,592.5	12.9	–0.2
20050616	095616.1	63.582	19.772	7,058.6	1,696.7	7.5	1.3
20050619	032304.2	64.417	20.053	7,152.4	1,704.5	3.4	0.1
20050619	083411.5	64.476	20.599	7,160.8	1,730.2	18.4	0.3
20050620	082418.4	64.414	20.051	7,152.1	1,704.4	4.2	1.0
20050620	211737.2	66.928	23.461	7,446.1	1,834.1	15.9	0.5
20050621	201044.8	64.192	20.706	7,129.7	1,737.8	17.2	–0.1
20050622	213040.5	61.896	17.250	6,865.5	1,575.8	5.3	0.0
20050622	235210.7	64.834	20.977	7,202.1	1,745.1	22.4	0.7
20050624	042541.5	66.369	13.830	7,364.6	1,411.5	10.5	3.1
20050625	203927.7	64.493	20.839	7,163.7	1,741.6	2.1	0.7
20050627	113512.1	64.390	21.208	7,153.6	1,760.3	6.2	–0.4
20050627	155342.3	64.380	20.969	7,151.6	1,748.9	6.0	0.1
20050628	211757.2	65.458	18.351	7,264.1	1,617.8	17.5	2.0
20050629	103505.0	66.027	19.831	7,330.9	1,682.4	7.1	1.3
20050630	104841.3	62.378	17.507	6,919.5	1,587.9	10.1	–0.1

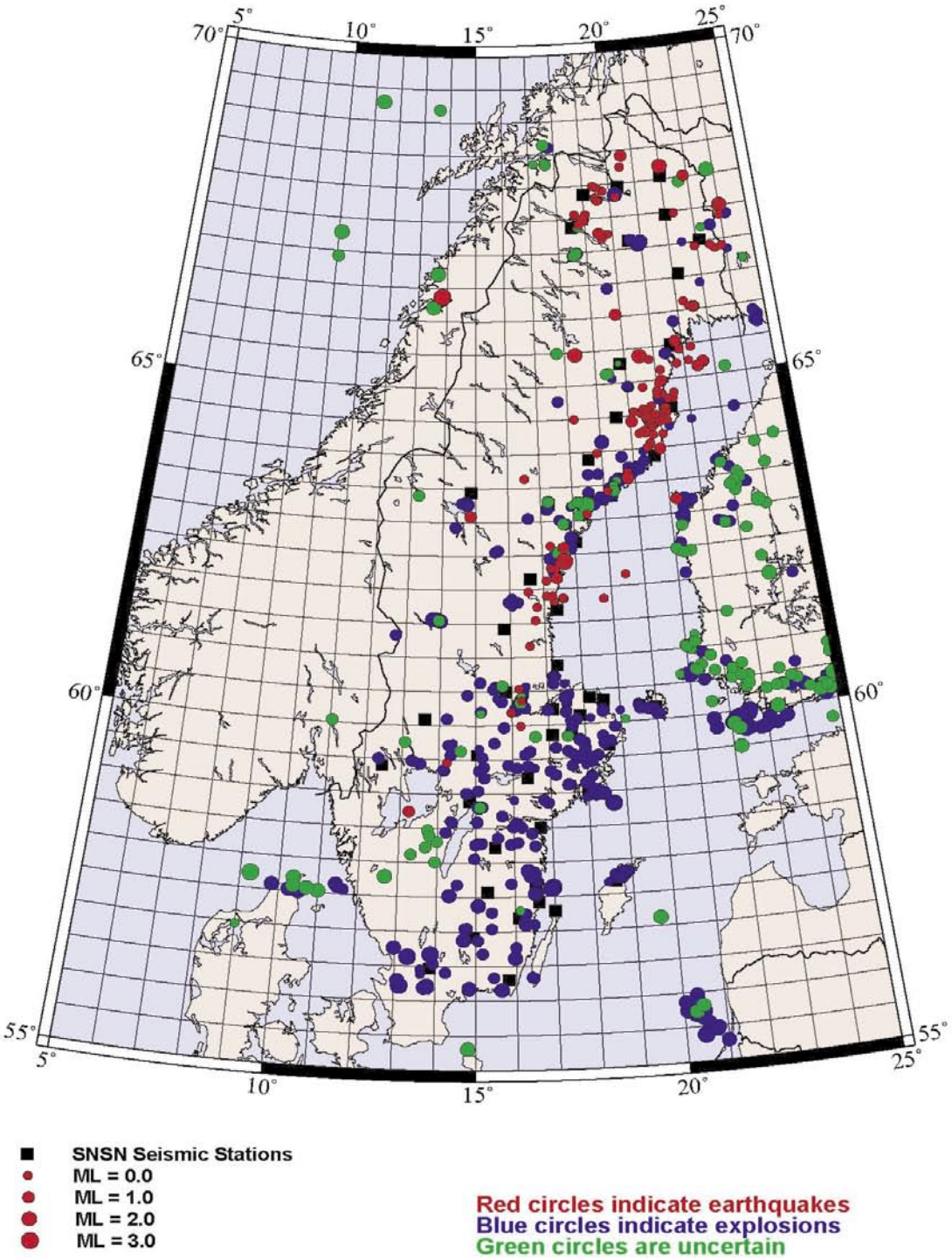

Figure 3-1. *Recorded events including explosions in the SNSN network during the period April through June 2005.*

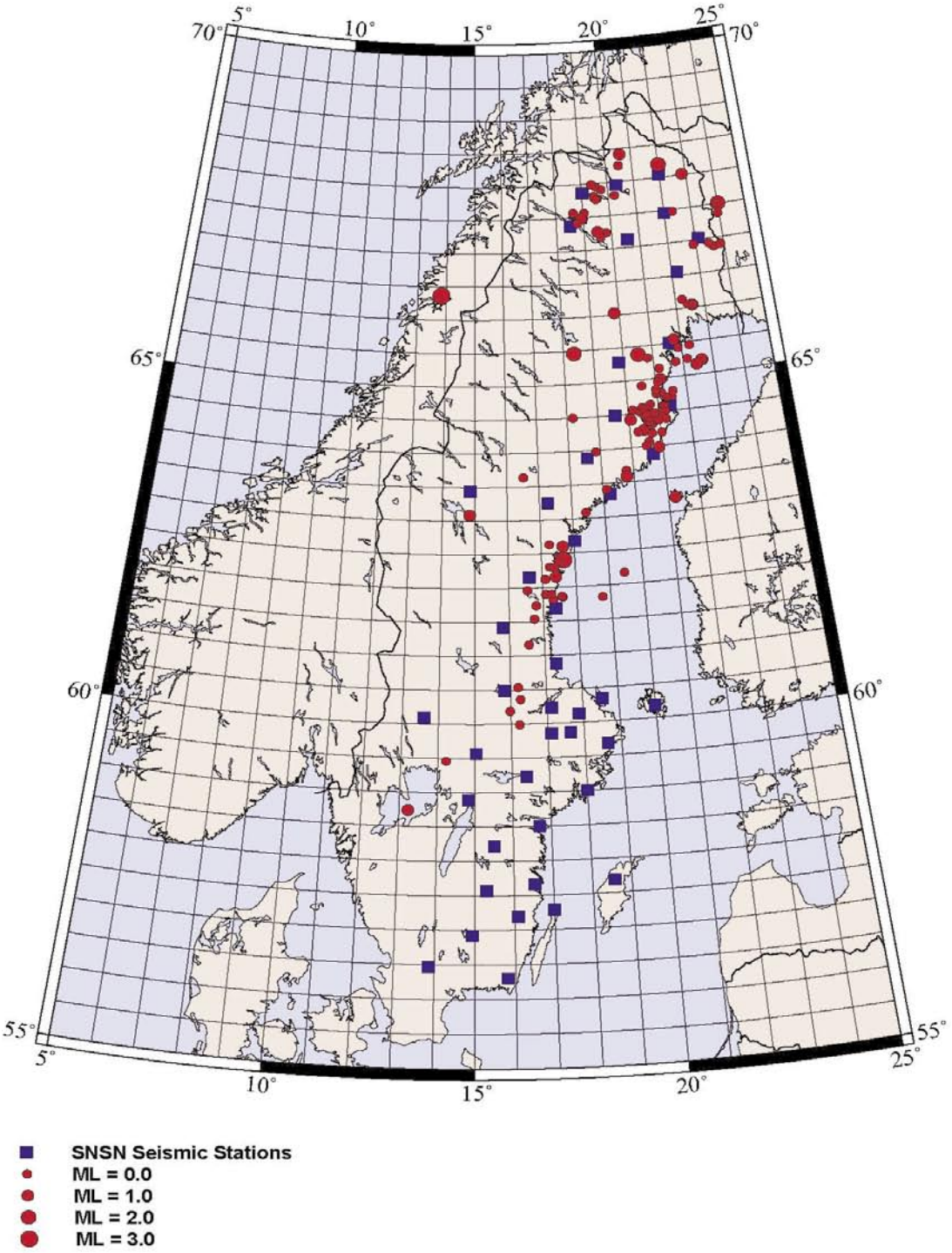

Figure 3-2. *Earthquake activity in Sweden during April through June 2005.*